국제학석사학위논문

Is the Vertical FDI Model of Korea Sustainable?

: The Home Country Effect of FDI
in the Korean Manufacturing Sector

한국의 수직적 해외투자모델은 지속 가능한가?

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서울대학교 국제대학원
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박 유 미

Is the Vertical FDI Model of Korea Sustainable?

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Thesis by

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Graduate Program in International Commerce
In Fulfillment of the Requirements
For the Degree of Mater of International Studies
February 2015

Graduate School of International Studies
Seoul National University
Seoul, Republic of Korea

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이 논문을 국제학 석사학위논문으로 제출함

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박 유 미

박유미의 석사학위논문을 인준함

2015년 2월

위 원 장 문 휘 창 (인)

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: The Home Country Effect of FDI

in the Korean Manufacturing Sector

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ABSTRACT

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The aim of this thesis is to analyze the changing relationship between Korean outbound FDI and the intermediate exports over time. The earlier studies regarding the impact of FDI on the home country's exports have been determining if it is a substitute or a complement. Recent Korean studies generally confirmed the positive relation between FDI outflow and trade, characterizing Korean outbound FDI as 'vertical FDI'. However, these previous studies have not considered the fact that this effect cannot be fixed, and a transition from 'vertical FDI' to 'horizontal FDI' could appear if the circumstance changes. To complement this limitation, this paper examines whether the transition from 'vertical FDI' to 'horizontal FDI' happened or not in the Korean manufacturing sector over previous decade.

First, how the correlation between 'Korean outbound FDI' and 'Korean intermediate exports' changes from 2001 to 2010 is analyzed. Afterward, how the factors like 'the host country market condition' and 'the investor's condition' affect the trend of this linkage is also examined. The 'least square model' analysis, using panel data from 40 countries and

14 manufacturing industries, show that the vertical specialization and the complementary impact of the outbound FDI have been intensified in the Korean manufacturing sector as a whole. However, in the industry-wise analysis, 11 among 14 industries have experienced the transition from 'vertical FDI' to 'horizontal FDI' while the FDI of 3 industries, taking 40% of the total outbound FDI on average, have displayed an opposite trend. As for the investor's size, the correlation between the outbound FDI of big investors and Korean intermediate exports has been weakened while the opposite has been seen in the small investors' cases.

This empirical result implies that the transition from 'vertical FDI' to 'horizontal FDI' generally happens in the analysis of industry dimension, and that it is also possible to sustain 'vertical FDI' depending on 'the success of effort to secure the comparative advantage in the high value stages' and 'the drastic increase of world demand for that industry's products'. Furthermore, it can be said that if this vertical FDI takes a majority portion in the whole FDI composition, it can make the whole outbound FDI trend in country level vertically specialized.

Keywords: Home country effect of FDI, Vertical FDI, Horizontal FDI, Transition, Outbound FDI, Intermediate goods, Vertical Trade

Student ID: 2006-22589

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CHAPTER I. INTRODUCTION

1.1. Background

The effect of an outbound FDI on home country has been a frequently visited theme for study since the FDI boom appeared after globalization. Among the many aspects of its effect, whether the outbound FDI brings a substitution or a complement on the domestic production has been one of key questions in the US and Europe. Most early US studies concluded that the complementarities outweighed the substitution effects since the stimulus to home exports of intermediate and other related products is more important when aggregated (Kokko, 2006). The analysis regarding Swedish multinational firms by Swedenborg (1979) and Blomstrom, Lipsey, and Kulchycky (1988) also found a positive relationship between FDI and exports.

Recently in Korea, the linkage between the outbound FDI and exports started being dealt with seriously as an outflow of Korean FDI increased. It became notable in terms of its volume and growing speed when its economy became an export oriented leader in the world. The conclusions of the studies generally confirm a positive relation between FDI outflow and exports. Ahn (2005) insisted that, overall, the internationalization of production has positive effects on the Korean economy. Moon (2007) argued that outward investment as well as inward investment is important

for enhancing the competitiveness of both the country and the firm because outward investment could lead to an increase in domestic production and employment through interactions between foreign and domestic operations. Suh (2008) also asserted that Korea's vertical trade was affected indirectly by relative fixed costs through the change in the stock of FDI. Those empirical findings characterize the outflow of Korean FDI as 'vertical FDI' which is contrary with 'horizontal FDI'.[1]

An interesting point to note is that the effect of FDI is not static and changeable according to the time period the studies were conducted in. Svensson (1996) brought a different analysis result from earlier studies done in the 1970s and 1980s on the same topic by observing a negative but insignificant overall effect of a Swedish firm's overseas production activity. Protsenko(2004) suggested the theory of the transition from 'vertical FDI' to 'horizontal FDI' based on the empirical evidence for German FDI in Central and Eastern Europe.

To sum up, the general and static conclusion is not enough for surveying the whole characteristics of FDI outflow. We need to look into the dynamic effect of the outbound FDI over time and what causes this change. If the change happens in the form of the transition Protsenko mentioned above, the assumptions on 'vertical FDI' in Korea will not be sustainable continually. Therefore, this paper will investigate the sustainability of the vertical FDI model in Korea by analyzing the changing relationship between Korean outbound FDI and a vertical trade.

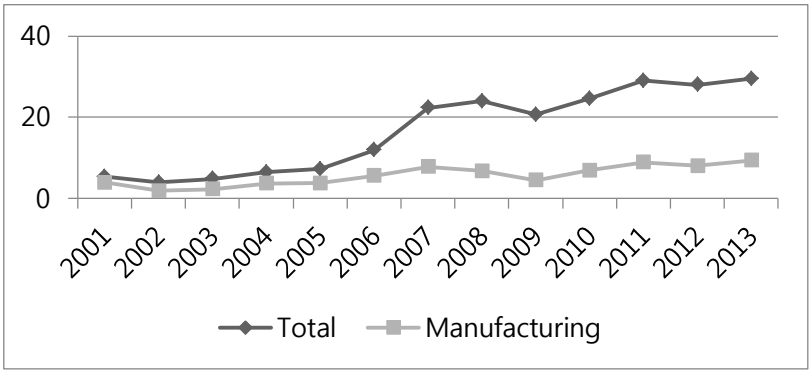
[1] The term 'vertical FDI' and 'horizontal FDI' will be explained specifically in the following chapters.

The following parts are organized as follows. First, the recent trend of FDI outflow in Korea will be illustrated with its statistics. Chapter 2 will review previous literatures regarding the linkage between the outbound FDI and a vertical trade after explaining the definition of 'vertical FDI'. Chapter 3 will suggest the model to examine the sustainability of 'vertical FDI' in Korea with data. Chapter 4 will show the empirical finding of this analysis. Finally, the conclusion will be put forward in Chapter 5.

1.2. Recent Trends

Korea outbound FDI in 2013 is about $ 30 billion, placing it 13th in the world(16th in 2012)[2]. Among this, the manufacturing sector takes a portion of 32% with over $9 billion share, and it has showed an overall growing trend with exception to the periods around the world financial crisis in 2009.

<Figure 1> The amount of the outbound FDI flow (unit: billion dollars)

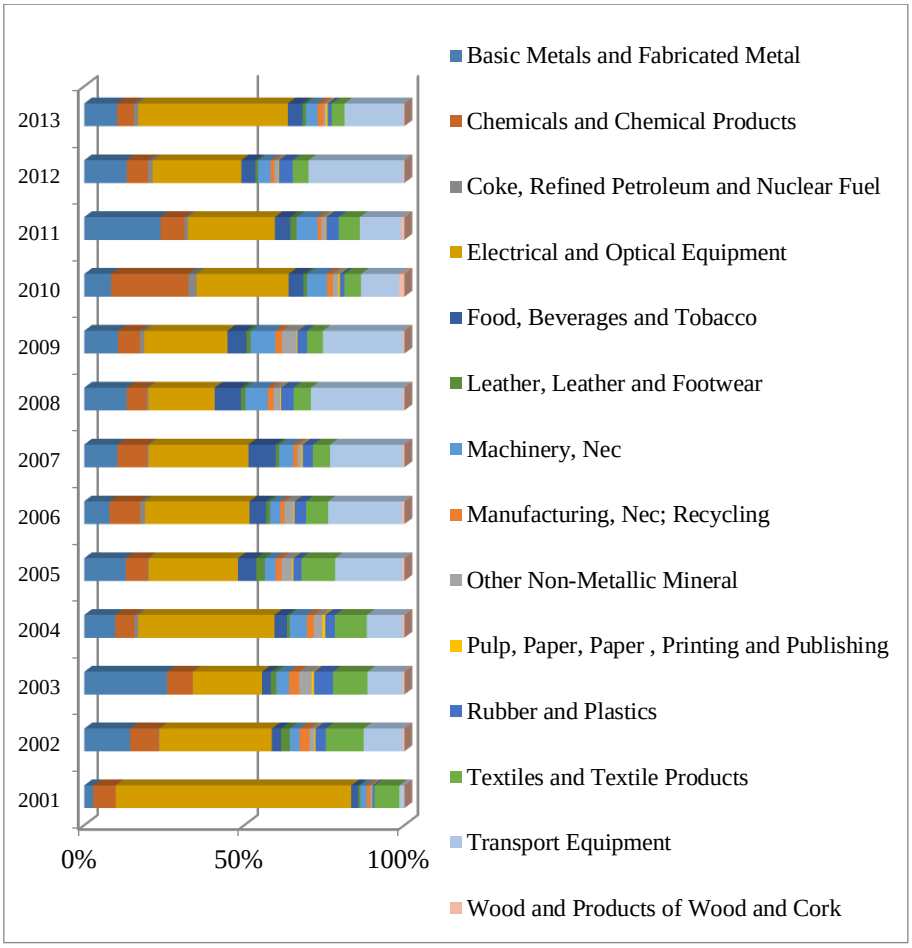


(source: EXIM bank)

[2] UNCTAD World investment report 2013

<Figure 2> illustrates how much portion each industry took from 2001 to 2013. 'Electric & Optical Equipment' has topped the list continually, except for 3 years (2003, 2008, 2012), and took a share of 46.8% in 2013. 'Transport Equipment' and 'Basic Metals and Fabricated Metal' followed behind 'Electric & Optical Equipment' in terms of total sum.

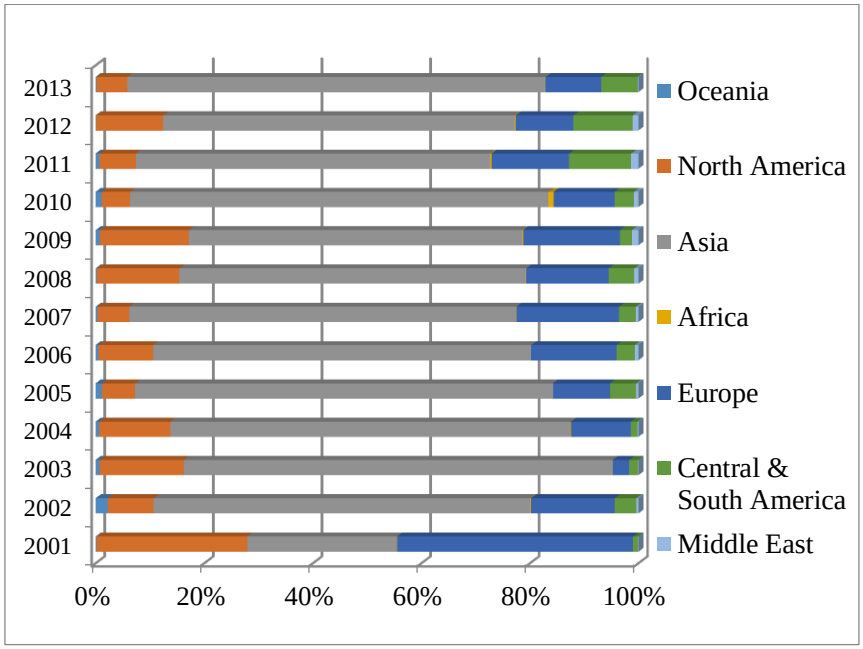
<Figure 2> Portion by the industry in the outbound FDI of the Korean manufacturing sector



(source: EXIM bank)

In <Figure 3>, Asia appeared as the most dominant destination of investments with a portion of 68% on average, and it is followed by Europe and North America in terms of total sum. Among Asian countries, China ranked first decisively, and it received $ 4.5 billion which is 48% of Korean outbound FDI in the manufacturing sector in 2013

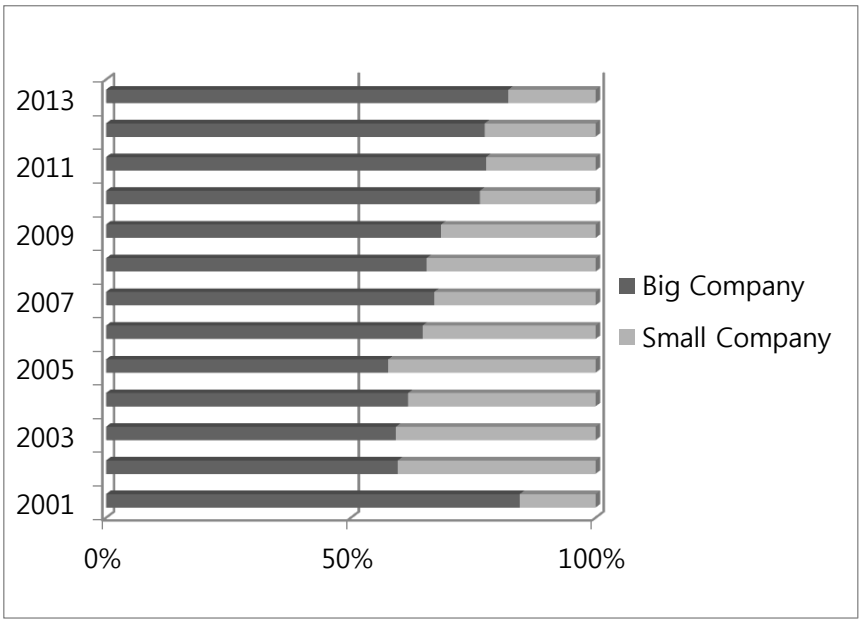
<Figure 3> Portion by the region in the outbound FDI of the Korean manufacturing sector



(source: EXIM bank)

As for the investor's size, the average share of 'big company' over 'small company' was 72%, and its portion has consistently grown except for in 2001 as shown in <Figure 4>.

<Figure 4> > Portion by the investor's size in the outbound FDI of the Korean manufacturing sector

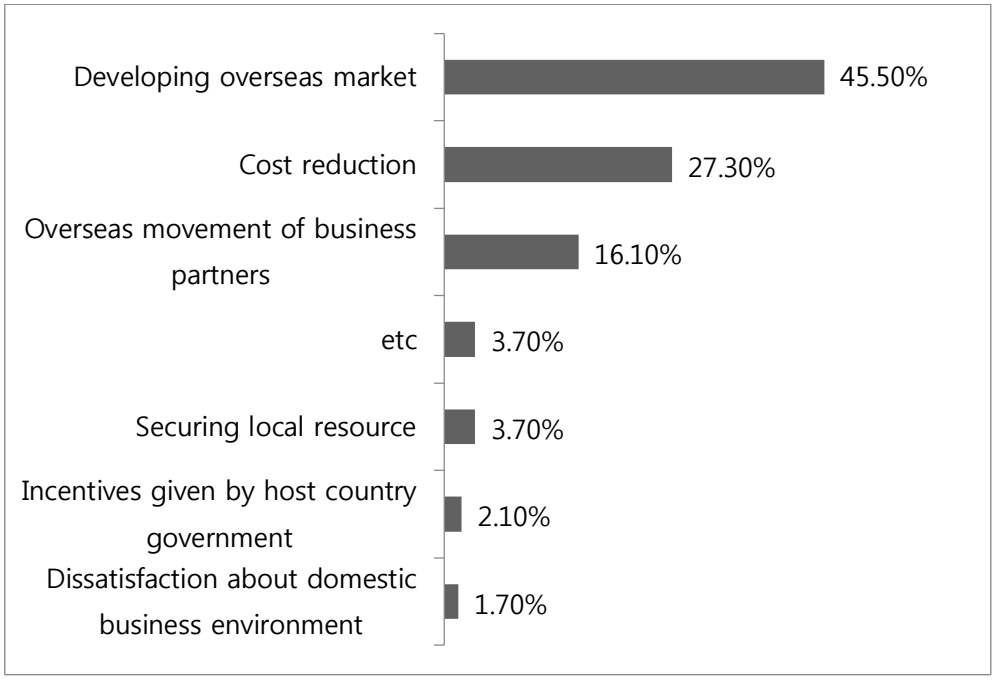


(source: EXIM bank)

A recent survey about the motives of FDI among manufacturing firms told that nearly half of the respondents selected 'developing overseas market', and it was followed by 'cost reduction' and 'overseas movement of business partners' as shown in <Figure 5>. Especially for 'transport equipment' industry, 'overseas movement of business partners' was the main motive.

Considering the fact that the motives of investors are more focused on local market which is related to horizontal incentive, we could expect the effect of a vertical specialization by the outbound FDI to decrease over time.

<Figure 5> The Portion by the investment motive in the outbound FDI of the Korean manufacturing sector



(source: Korea Industrial Complex Corp, 2013)

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CHAPTER II. LITERATURE REVIEW

The literatures have been reviewed to answer two different questions. One is about 'the definition of vertical FDI', and the other is about the relationship between 'Outbound FDI' and 'Vertical Trade'.

2.1. How to Define 'Vertical FDI?'

'Vertical FDI' could be explained by distinguishing it from horizontal FDI. Horizontal FDI takes place when firms deploy its production site for similar goods or services in various countries to lower trade barriers and transport costs by locating closer to final customers. In 'vertical FDI', firms slice down the production process into various separate stages to take advantage of input price differential. As a result, many countries come to participate in the same production chain according to the relative endowment of inputs. These two kinds of FDI affect domestic production in opposite ways. Domestic and foreign productions are substitutes in 'horizontal FDI', since products are manufactured and sold in the final markets. In contrast, those two are complementary in 'vertical FDI', because each country takes charge of different stages of the same production process (Markusen and Maskus, 2001).

However, in reality it is difficult to measure and distinguish between these horizontal and vertical FDI. Bronzini (2010) observed that on the

empirical level, it is hard to classify the majority of FDI into just one of these two categories. He also mentioned that with that reason, UNCTAD (1998) invented the term "complex integration strategies" to explain firms' behavior seeking new forms of internationalization outside the' vertical-horizontal paradigm'. Furthermore, measuring 'vertical FDI' is difficult unless you know the intention or motivation of investors. This is mainly an internal decision made by investors regarding the complicated production stages. In Korea, still no data aggregated in this dimension were found.

Thus, in this research, the definition of 'vertical FDI' is designated like this:

If the outbound FDI in one country turns out to have strong linkage with the vertical trade, this outbound FDI will be considered as 'vertical FDI'.

Then, how should we measure the vertical trade? Hummels, Rapoport and Yi (HRY, 1998) defined three conditions for the vertical trade to occur and suggested the way to measure it.

(1) A good is produced in two or more sequential stages.

(2) Two or more countries provide value-added during the production of the good.

⑶ At least one country must use inputs in its stage of the production process, and some of the resulting output must be exported.

Suh Yong Kyung (2008) found that Korea's trade has been becoming more vertically specialized over the last ten years. He said that in particular, the vertical exports to China have grown rapidly since the early 2000's, and

thus the surplus on the vertical trade has widened dramatically in recent years by using HRY's method. .

In this paper, a vertical import will not be included for measuring the vertical trade even though the term 'trade' originally contains export and import together. Only a vertical export will be used. By simply measuring intermediate use of Korean products in the forward or backward supply linkage, we could easily determine whether the effect of FDI is a substitute or a compliment.

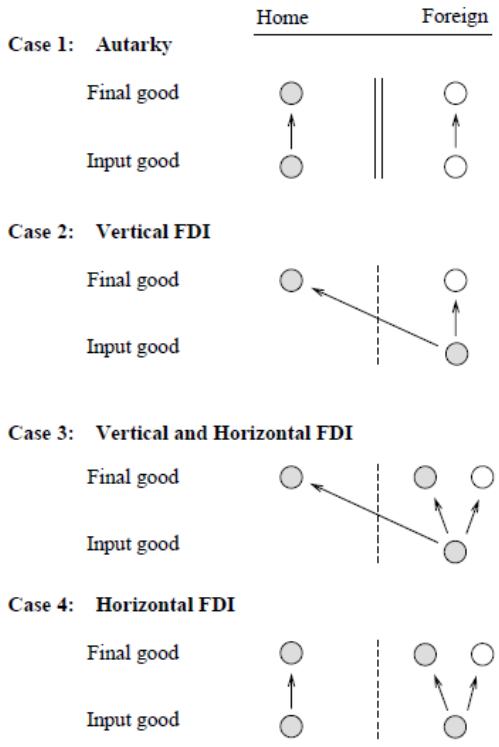
2.2. What Happens in the Linkage between the Outbound FDI and the Vertical Trade?

2.2.1. Theoretical Review

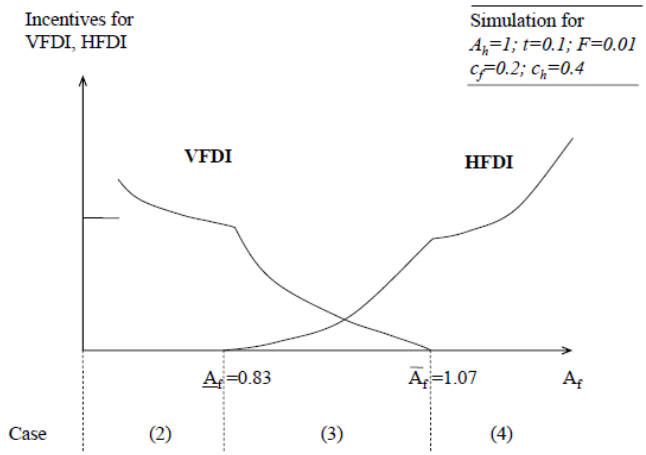
The theoretical framework regarding the changing relationship between the FDI and the vertical trade over time was suggested by Alexander Protsenko (2004). His model, 'FDI life cycle' explains the changing composition of FDI flows over time. According to his explanation, the cost seeking 'vertical FDI' is dominant by taking advantage of the foreign market's low factor prices in the beginning. As the host market becomes larger than before, market seeking 'horizontal FDI' will come into the foreign market. These FDI inflows raise factor prices, and the host country starts becoming less profitable for 'vertical FDI'. Therefore, a high but

descending share of ‘vertical FDI’ and a rising share of ‘horizontal FDI’ in the host country are observed. Protsenko argued that the idea of “FDI Life Cycle” is supported by the empirical evidence of German FDI in Central and Eastern Europe. While the share of ‘vertical FDI’ on total German FDI projects was stable in the beginning of the 1990s, it has continuously fallen after 1996. Empirical tests for 13 transition countries also indicate the changing structure of FDI inflows: the market size of the host country and the unit labour costs have negative impacts on the share of ‘vertical FDI’ inflows

<Figure 6> FDI life cycle



<Figure 7> FDI incentives and the size of the foreign market



2.2.2. Empirical Review

Several empirical studies support this transition from 'vertical FDI' to 'horizontal FDI' in the theory mentioned above. The first case is about Sweden firms. Head K. and J. Ries (2001) found that Svensson (1996) observed a negative but insignificant overall effect of a Swedish firm's overseas production activity on its exports. Earlier studies on Sweden MNEs by Swedenborg (1979) and Blomstrom, Lipsey, and Kulchycky (1988), which used similar but less updated data, found a predominantly positive relationship between FDI and exports.

Debaere et al (2010) argued that more and more Korean firms having a backward and forward linkages with one another are investing in China to

substitute the intermediary goods once produced in Korea. Head K. and J. Ries (2001) pointed out that those that are unlikely to ship intermediates to overseas production affiliates exhibit the substitution. These previous literatures indirectly support that the increasing the outbound FDI could eventually reduce the vertical export in Korea by substituting home production of intermediates.

However, until now very few previous foreign or Korean researches were conducted to examine the transition from ‘vertical FDI’ to ‘horizontal FDI’ in Korea. Kim and Kim (2005) exceptionally pointed out that the positive effect of the outbound FDI on exports in some industries seemed to decrease from 1997 to 2001. However their export data included final products, and did not focus on the intermediates which are the main items of the vertical trade in all manufacturing industries. Besides considering that the amount and the trend of the outbound FDI they studied changed over, the new research about ‘whether that kind of transition is happening in Korea or not recently’ is needed. Therefore to fill this vacancy, this paper will focus on the changing relationship between the outbound FDI and the vertical trade over time.

CHAPTER III. THE LINKAGE BETWEEN THE OUTBOUND FDI & THE VERTICAL TRADE

3.1. Research Question and Hypothesis

Alexander Protsenko (2004) insisted that the vertical FDI in the beginning stages will not be sustained over time. However, in the previous Korean literature, the direction of the outbound FDI's effect throughout some periods was the main issue, and this gradual transition was rarely studied.

Thus, the first research question could be summed up and transposed into an hypothesis like this:

Q1: Is the present vertical FDI model of Korea sustainable?

→ H1: The linkage between the outbound FDI and the vertical trade has been weaken over time.

This hypothesis could be verified by looking at how the correlation between the outbound FDI and the vertical trade changes over time.

After setting the model to test, how some other conditions affect the

linkage between the outbound FDI and the vertical trade could be examined furthermore. Therefore, the research question for this purpose will be given and transposed into an hypothesis below:

Q2: how do the conditions of 'host country market & investors' affect the linkage between the outbound FDI and the vertical trade over time?

→ H2: According to the condition of 'host country market & investors', the linkage has changed differently over time.

With the control of host country conditions relating to market, the trend of correlation between outbound FDI and the vertical trade will be examined more clearly since many market related factors influence on the vertical trade. We also could see what kind of direction the effect of host country's market condition is going to be. According to Protsenko (2004), the effect of host country's market condition will become stronger as horizontal incentive increases.

The effect of 'the investor's condition' will be studied in terms of investor's size and industry. One report issued by Korean Development Bank in 2011 said that the effect of FDI on exports by small medium size firms turn out to be bigger than those by big size firms. The reasons is that big firms have already reached a certain level of competitiveness for exports, and has very little left for an additional achievement, while small-medium firms still have a lot of potential. This finding could be applied to this research with respect to how the trend of FDI's effect is different from the size of investors. Furthermore, the question of whether a significant difference between industries exists will be looked into.

3.2. Methodology

To test the hypotheses in the previous section, first, the panel data over 10 years from 2001 to 2010 were constructed on pairs, Korea's outbound FDI versus the amount of Korean products' intermediate use in 14 manufacturing industries of 40 countries[3]. Korea's outbound FDI data were collected in terms of 'flow' from Korean EXIM bank website[4], and the amount of Korean products' intermediate use drawn from OECD WIOD database were employed as the measurement of the vertical trade. With this data, the basic panel least square model is used to investigate how the linkage between these two variables changes during the 5 subsample periods. Each subsample period spans 6 years, and periods are rolled backward by 1 year so that this test will be free from any particular peculiarity of each year.[5]

Second, to examine the factors affecting the linkage between the outbound FDI and the vertical trade, some more variables are added to Korea's outbound FDI as independent variables in the former basic regression model.

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[3] OECD WIOD (World input output database) provides data of 40 countries which constitute about 85% of world GDP. It also divides whole industries into 35 categories, and 14 among them are manufacturing industries.

[4] Currently, Korean EXIM bank provides FDI data only in terms of 'flow' since it is hard to aggregate 'stock' due to the difficulty of tracking withdrawals and transfers of FDI outside Korea.

[5] 5 subsample period: 2001-2006, 2002-2007, 2003-2008, 2004-2009, 2005-2010

As for factors relating to the host country market condition, Kim and Kim (2005) adopted GDP per capita and population as explanatory variables affecting Korea's exports, and they say that it shows the level of economic development and the size of market. Since these two variables influence on the amount of Korean products' intermediate use, another regression model including these variables is built. Additionally, this model will be run again separately only for China, to know whether any difference exist between China, the biggest Korean FDI destination, and the other countries.

As for factors relating to the investor's condition, analysis will be done to see whether the investor's size or the industry affects this linkage. 'Korea's outbound FDI of big investors' or 'Korea's outbound FDI of small investors' will be placed on as an independent variable instead of 'Korea's outbound FDI' in the basic regression model. FDI data according to the investor's size are available in Korean EXIM bank website. To figure out whether the industry matters or not, we will use the basic regression model built in the beginning, and analyze it in the aspect of industry.

3.2.1. Basic Regression Equation

The following is the basic regression model to see the bilateral linkage between the outbound FDI and the vertical trade.

$$ln\ VT_{ij(t)} = \alpha + \beta * ln\ Outbound\ FDI_{ij(t-1)}$$

As mentioned before, the amount of Korean products' intermediate use was used as the measurement of VT, which is the vertical trade. 'i' connotes the host country of FDI, and 'j' connotes the industry. 't' means the year of the transaction. Assuming that it will take time to realize the effect of the outbound FDI, 1 year time difference was put between VT and the outbound FDI. All variables use *log*. To avoid getting distorted results by missing countries without transaction with Korea, 1 was added to all value and *log* was taken.

This same basic regression model was run 5 times on each subsample period data set. By looking at the trend of β, we could verify the hypothesis. According to the hypothesis that the linkage between the outbound FDI and the vertical trade will be weaken, β should decrease.

3.2.2. Regression Equations about the Factors Affecting the Linkage

The model to examine the effect of host country market condition will be the following.

$$ln\ VT\ i(t) = \alpha + \beta 1 * ln\ Outbound\ FDIi(t-1) + \beta 2 * ln\ GDP\ per\ Capita\ i(t) + \beta 3 * ln\ Population\ i(t)$$

In order to examine China and the other countries separately, another regression model with a dummy variable, 'China', is also built.

$$ln\ VT\ i(t) = \alpha + \beta 1 * ln\ Outbound\ FDIi(t-1) + \beta 2 * ln\ GDP\ per\ Capita\ i(t) + \beta 3 * ln\ Population\ i(t) + \beta 4\ China.$$

To see the effect of the investor's size, two separate models were set up according to the size of investors.

$$ln\ VT\ ij(t) = \alpha + \beta * ln\ Outbound\ FDI\ of\ big\ investors\ ij(t-1)$$

$$ln\ VT\ ij(t) = \alpha + \beta * ln\ Outbound\ FDI\ of\ small\ investors\ ij(t-1)$$

The amount and trend of β in two models will be compared each other to check whether a difference exists according to the size of investors. Though it is more desirable to test with different data sets for the dependent variable according to the investor's size, the same data (including both big investor's exports and small investor's exports) will be used for the dependent variables since the OECD does not provide the amount of Korean products' intermediate use based on the investor's size.

As for the effect of the industry, the basic regression model will be run on the basis of industries.

$$ln\ VT\ j(t) = \alpha + \beta * ln\ Outbound\ FDI\ j(t-1)$$

Every regression model above will be run 5 times on each subsample period data set to look at the trend of β.

3.2.3. Overall Variables

<Table 1> shows the summary of the variables used for the analysis.

<Table 1> Overall variables

variables	definition	Source
VT	the amount of Korean products' intermediate use (current $)	I/O table from OECD
Outbound FDI	the amount of Outward FDI from Korea (current $)	EXIM bank of Korea
Outbound FDI of big investors	the amount of Outward FDI from Korean firms with revenue over 5 trillion korean won (current $)	EXIM bank of Korea
Outbound FDI of small investors	the amount of Outward FDI from Korean firms with revenue less than 5 trillion korean won (current $)	EXIM bank of Korea
GDP per Capita	Gross domestic product per capita (current $)	World Deveopment indicator
Population	the number of all the people who live in it.	World Deveopment indicator

CHAPTER IV. Empirical Analysis & Finding

In this section, the results of the regression models previously adopted for this hypothesis test will be analyzed.

4.1. The Linkage between the Outbound FDI and the Vertical Trade

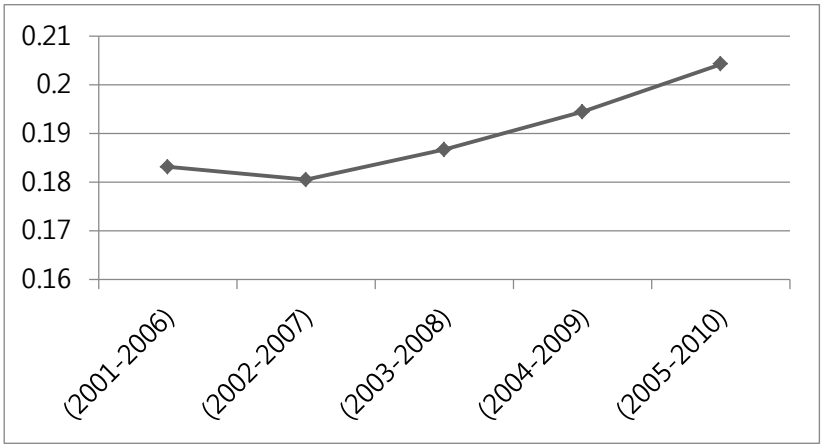
<Table 2> shows the result of the basic regression model.

<Table 2> Basic regression model

Basic model	Period 1 (2001-2006)	Period 2 (2002-2007)	Period 3 (2003-2008)	Period 4 (2004-2009)	Period 5 (2005-2010)
Outbound FDI(log)	0.183085*** (7.638768)	0.180429*** (7.475984)	0.186595*** (7.747098)	0.19438*** (9.00748)	0.204172*** (10.71738)
Constant	18.15397***	18.29834***	18.23823***	18.29163***	18.29481***
No. of Observations	244	244	244	243	242
R^2	0.194275	0.187621	0.198722	0.251866	0.323681

(Standard error in parentheses; *,**, and *** denotes significant level of 10%, 5%, and 1%)

<Figure 8> The coefficient's trend in the outbound FDI



The outbound FDI is significant throughout the whole periods, and the signs of coefficients are all positive. It means that outbound FDI of Korea promotes Korean products' intermediate use in the world. Surprisingly, the direction of change in the outbound FDI's coefficient over time is opposite to our theoretical prediction. As <Figure 8> displays, the coefficient keeps increasing except for the 2nd period. The coefficient value in the 5th period, '0.204', means that the amount of Korean products' intermediate use increases by 0.204% if the outflow of Korean FDI increases by 1%. Compared to the coefficient value in the 1st period, 0.183, the range increased by 0.021%. Further analysis in the level of the factors affecting the linkage will explain why the result of the basic regression is inconsistent with the hypothesis.

4.2. The Factors Affecting the Linkage

4.2.1. Host country market condition

<Table 3> shows the result of the regression model with control of the host country's market condition. Every variable is significant, and its coefficients are all positive. However, the outbound FDI and the other 2 independent variables show opposite trends of coefficients over time. The outbound FDI' coefficients increases as it does in the basic model, but the coefficient in the first period jumped to a value that is 2.3 times the last period, while it increased to a value that is 1.12 times the previous basic model. On the other hand, in the other 2 variables relating to the host market condition, the coefficients in both GDP per Capita and population decrease over time, which means horizontal incentives are getting weaker. According to the theoretical expectation, the coefficient's trend in the outbound FDI and the 2 other variables should show opposite directions.

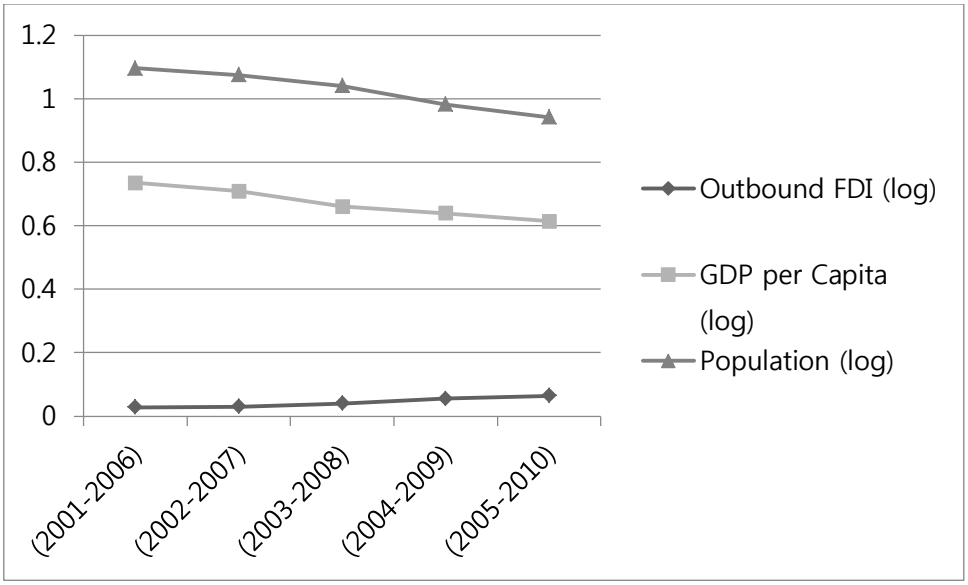
<Table 4> also shows that the same kind of result appears regardless of the host country. This is so because similar features are found in China and the other countries.

<Table 3> Regression with control of host country market condition

	Period 1 (2001-2006)	Period 2 (2002-2007)	Period 3 (2003-2008)	Period 4 (2004-2009)	Period 5 (2005-2010)
Outbound FDI (log)	0.02776*** (2.896822)	0.030445*** (3.112304)	0.039684*** (3.854076)	0.054804*** (5.267764)	0.063949*** (5.866555)
GDP per Capita (log)	0.734388*** (12.95429)	0.708608*** (11.85882)	0.660527*** (10.28533)	0.63941*** (9.438853)	0.613386*** (8.518387)
Population (log)	1.095739*** (23.87939)	1.074191*** (22.9191)	1.040576*** (21.10616)	0.981374*** (19.61961)	0.941759*** (18.12605)
Constant	-5.344861	-4.680818	-3.769044	-2.69319	-1.821588
No. of Observations	228	227	226	225	224
R^2	0.855226	0.843054	0.832134	0.828703	0.826223

(Standard error in parentheses; *,**, and *** denotes significant level of 10%, 5%, and 1%)

<Figure 9> The coefficients' trends with control of the host country's market



<Table 4> Regression with China dummy

	Period 1 (2001-2006)	**Period 2 (2002-2007)**	**Period 3 (2003-2008)**	**Period 4 (2004-2009)**	**Period 5 (2005-2010)**
Outbound FDI (log)	0.02686*** (2.909508)	0.030091*** (3.189545)	0.040229*** (4.032251)	0.056274*** (5.578082)	0.06613*** (6.239099)
GDP per Capita (log)	0.780922*** (14.02959)	0.756341*** (12.87839)	0.707509*** (11.16754)	0.687266*** (10.29292)	0.660699*** (9.303266)
Population (log)	1.060282*** (23.5843)	1.036985*** (22.51638)	1.001874*** (20.54394)	0.939521*** (18.92905)	0.89796*** (17.35165)
China	1.637479*** (4.299225)	1.659427*** (4.214561)	1.618478*** (3.937289)	1.629686*** (3.918285)	1.600208*** (3.791715)
Constant	-5.223568	-4.553991	-3.625113	-2.520107	-1.622107
No. of Observations	228	227	226	225	224
R^2	0.866307	0.854681	0.843138	0.839878	0.836929

(Standard error in parentheses; *,**, and *** denotes significant level of 10%, 5%, and 1%)

To sum up, a strong vertically specialized trend is observed in the models with control of the host country market condition as well as in the basic model. Then, the ground for inconsistency with hypothesis should be dealt with in the following analysis.

4.2.2. The investor's condition

As for the regression model testing the effect of the investor's size, the

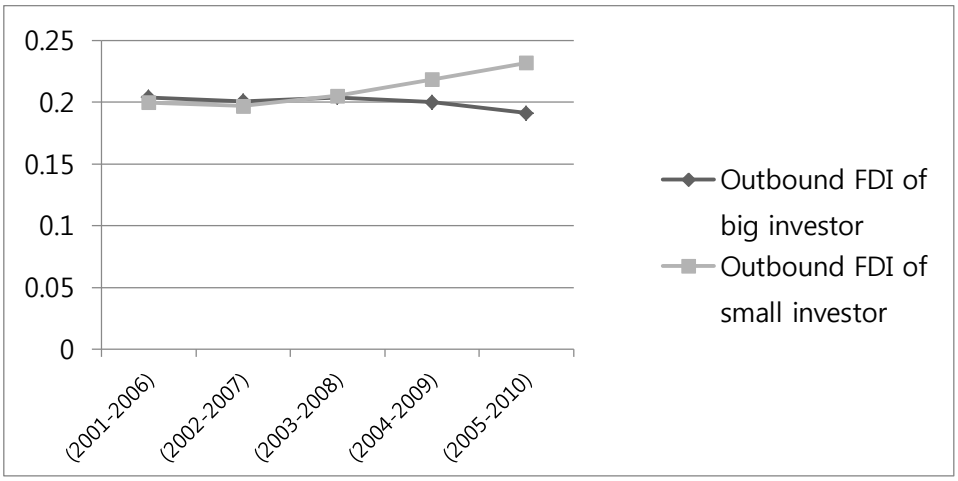
independent variable, ‘outbound FDI’ is replaced with ‘outbound FDI of big investors’ or ‘outbound FDI of small investors’.

<Table 5> Regression with investor's size

	Period 1 (2001-2006)	Period 2 (2002-2007)	Period 3 (2003-2008)	Period 4 (2004-2009)	Period 5 (2005-2010)
OFDI of big investors (log)	0.203995*** (9.205588)	0.200882*** (9.106519)	0.203996*** (9.408456)	0.199894*** (10.14091)	0.191297*** (10.69188)
Constant	18.32007***	18.51377***	18.48414***	18.62184***	18.82743***
No. of Observations	244	244	244	243	242
R^2	0.259356	0.255221	0.267818	0.299088	0.322639
OFDI of small investors (log)	0.199661*** (7.763588)	0.19693*** (7.708111)	0.205197*** (8.00113)	0.21832*** (9.483456)	0.23196*** (11.66363)
Constant	18.29826***	18.39461***	18.29271***	18.2688***	18.24897***
No. of Observations	244	244	244	243	242
R^2	0.1994	0.19712	0.209197	0.271762	0.361771

(Standard error in parentheses; *,**, and *** denotes significant level of 10%, 5%, and 1%)

<Figure 10> The coefficients' trend with the investor's size



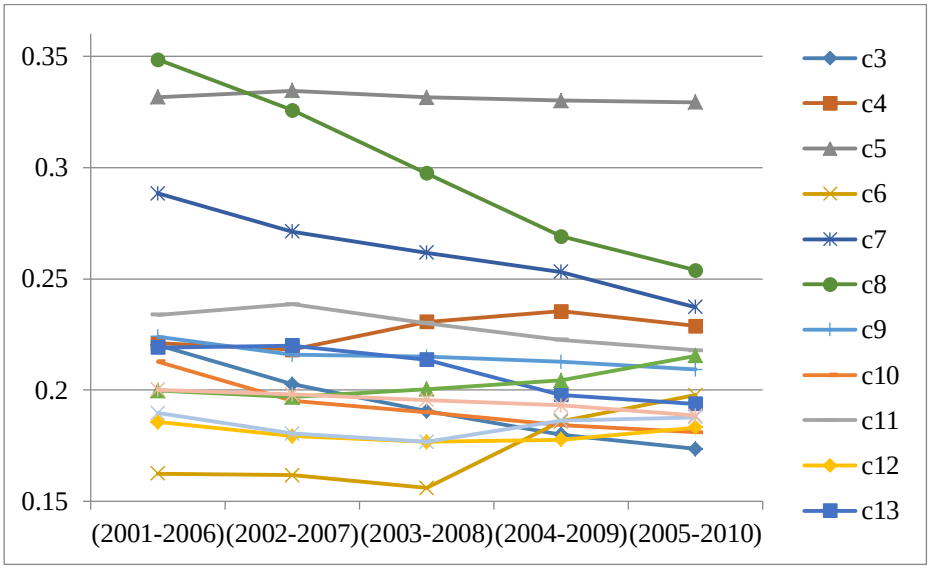
For both big and small investors, the outbound FDI is significant, and its coefficients are all positive. In this model, the result is consistent with theoretical expectations. In the hypothesis, we predict that the effect of the small investor's FDI will increase more than that of big investors since the big investors have already reached the certain level of competitiveness for export, and has very little left for an additional achievement. <Figure 10> shows that the coefficient of big investors is bigger than small investors' in the beginning, but the situation is reversed as it continually decreases while the other side increases.

Finally, the effect of the industry will be analyzed with the results shown in <Table 6>. Over all industries, the outbound FDI has proven to have a positive and significant effect. Among the 14 industries, trends of 11 industries' coefficient are consistent with the hypothesis which means that coefficients are decreasing over time. Still, 3 industries are moving in the opposite direction to our hypothesis: 'Textiles & Textile Products', 'Wood, Products of Wood & Cork', and 'Electrical & Optical Equipment'.

How could the deviation of these 3 industries be explained? The answer could be given by looking at whether the industry's effort to keep comparative advantage of the high value added stages in global fragmented production system succeeded or not, and whether something special related

to the leap of world demand for that industry's products occurred. The 'Electrical & Optical Equipment' industry is the representative industry of Korea with a strong comparative advantage, and the R&D investment is most vigorous in this sector. The 'Textiles & Textile Products' industry used to be labor intensive with low wage, but now Korean industry is gaining competitiveness in the high value added technical textile for non-clothing industrial use by developing a high tech materials actively[6].

<Figure 11> The coefficients' trends with the industry



[6] Report by KIET, 2013.11, '섬유산업의 최근 동향과 전망'

<Table 6> Regression with the industry

	Period 1 (2001-2006)	Period 2 (2002-2007)	Period 3 (2003-2008)	Period 4 (2004-2009)	Period 5 (2005-2010)	Trend
c3 Food, Beverages & Tobacco	0.22016*** (11.70768)	0.202669*** (11.70148)	0.190532*** (11.77941)	0.180065*** (11.24364)	0.173625*** (10.89063)	-
c4 Textiles & Textile Products	**0.221111*** (12.23084)**	**0.218183*** (11.71317)**	**0.230602*** (12.14006)**	**0.235478*** (12.0769)**	**0.228758*** (11.6687)**	+
c5 Leather, Leather & Footwear	0.33154*** (7.997566)	0.334479*** (8.234106)	0.331457*** (8.019453)	0.329987*** (7.619879)	0.329225*** (7.319035)	-
c6 Wood, Products of Wood & Cork	**0.162553*** (4.62485)**	**0.161775*** (4.861949)**	**0.156041*** (4.917344)**	**0.185914*** (6.493014)**	**0.197765*** (8.203342)**	+
c7 Pulp, Paper, Printing&Publishing	0.288331*** (9.587431)	0.271267*** (9.786576)	0.261652*** (9.945538)	0.253057*** (9.682815)	0.237346*** (9.228024)	-
c8 Coke, Refined Petroleum & Nuclear Fuel	0.348407*** (4.393116)	0.325633*** (4.453323)	0.297335*** (4.1522)	0.269025*** (4.039385)	0.253794*** (3.825998)	-
c9 Chemicals & Chemical Products	0.224012*** (12.48919)	0.215897*** (12.07499)	0.215058*** (11.90892)	0.212677*** (11.71946)	0.20919*** (11.61429)	-
c10 Rubber & Plastics	0.212781*** (9.373593)	0.195125*** (9.215238)	0.19019*** (9.895886)	0.184429*** (9.909197)	0.181152*** (10.02705)	-
c11 Other Non-Metallic Mineral	0.233816*** (8.467788)	0.238508*** (8.816396)	0.230114*** (8.536226)	0.2226*** (8.125303)	0.217818*** (8.115831)	-
c12 Basic Metals & Fabricated Metal	0.185655*** (9.191896)	0.179366*** (9.385949)	0.176826*** (9.667509)	0.177718*** (10.27744)	0.183249*** (11.30931)	-
c13 Machinery, Nec	0.219106*** (9.178565)	0.220077*** (9.764011)	0.213705*** (10.02467)	0.197887*** (9.621027)	0.193898*** (9.919632)	-
c14 Electrical & Optical Equipment	**0.19971*** (12.27486)**	**0.196926*** (12.38009)**	**0.200437*** (12.91963)**	**0.204424*** (13.59181)**	**0.215411*** (14.89305)**	+
c15 Transport Equipment	0.189688*** (7.250154)	0.180544*** (7.243953)	0.176747*** (7.551841)	0.186395*** (8.556538)	0.187862*** (8.863894)	-
c16 Manufacturing, Nec; Recycling	0.200171*** (9.370531)	0.198075*** (9.348514)	0.195561*** (9.335805)	0.193117*** (8.94649)	0.188619*** (8.839004)	-

(Standard error in parentheses; *,**, and *** denotes significant level of 10%, 5%, and 1%)

Then, why is the result for the 'Transport Equipment' industry, which is another Korea's representative high tech and high value added industry, different? In the 'Transport Equipment' industry, automobile products are big and very heavy, so horizontal incentive is higher than other industries since it is more advantageous to procure and manufacture in the place neighboring the market to avoid excessive logistics cost. Moreover, the effect of the outbound FDI on reduction of the domestic manufacturing is biggest in the 'Transport Equipment' industry', compared to other industries <Table 7>. That is why the coefficient in 'Transport Equipment' is relatively smaller than other industries', and is decreasing over time.[7]

<Table 7> The effect of the outbound FDI on reduction of the domestic manufacturing

Industry	The effect of reducing manufacturing (1000 Korean won)
Transport Equipment'	13,120
Basic Metals and Fabricated Metal	1,068
Plastics	737
Electrical and Optical Equipment	486
Machinery, Nec	402

(source: research institute of KDB, 2007.11)

[7] Report by research institute of KDB, 2007.11, '자동차업계의 해외투자효과분석'

What is the reason of the deviation of ‘Wood, Products of Wood & Cork’ which is not a high tech & competitive industry in Korea? The coefficient of this industry drastically increased in the latter part of the periods. In the late 2000s, the demand for construction in China rapidly soared due to the fast economic growth and urbanization, and the demand of wood used for building also sharply increased.[8] In this background, the effect of the outbound FDI to increase the use of Korean intermediate seemed to have multiplied.

In summary, the coefficient of the outbound FDI generally tends to decrease over time as the hypothesis estimated when we analyze the data in the aspect of industry. However, depending on ‘the success of effort to keep vertical incentives high against horizontal incentives by securing comparative advantage in the high value stages’ and ‘drastic increase of world demand for that industry’s products’, it seems possible to keep the vertical specialization continually.

[8] Report by Japan External Trade Organization 2012.03

CHAPTER V. CONCLUSION

Many recent studies in Korea started dealing with the linkage between the outbound FDI and the exports seriously as Korean outbound FDI has shown noticeable growth in its volume and rate of increase. Those studies mostly focused on judging whether the outbound FDI brings a substitution or a complement on the domestic production, and generally seeks to confirm complementary impact, by characterizing this investment as 'vertical FDI'. However, this effect is not fixed, and is changeable according to the time periods the studies were conducted in. Therefore we cannot assure that this complementary impact of 'vertical FDI' model will last forever continually. This paper investigated the sustainability of the vertical FDI model in Korea by analyzing the changing relationship between Korean outbound FDI and the vertical trade

Throughout the analysis, the hypothesis, ' The linkage between the outbound FDI and the vertical trade has been weaken over time', turned out to be most fitting into the results of industry-wise analysis as 11 among 14 industries are consistent with the hypothesis. However, it is also possible to sustain 'vertical FDI' as long as the industry continues predominance in comparative advantage or special market environments such as the drastic demand increase supports the industry. Furthermore, if this vertical FDI

takes a lot of portion in the whole FDI composition, it can make the whole outbound FDI trend in country level vertically specialized against the influence of the host country's market. 3 industries with the vertical specializing trends take 40% of the total outbound FDI on average. As for the investor's size, the case of big investors is consistent with the hypothesis while the correlation between the outbound FDI and use of Korean intermediate product still deepens in small investors' cases. Considering the fact small investors are rather second movers, it would be interesting to watch later whether their trends will become similar with big investors'.

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국문초록

본 논문은 한국의 해외투자와 중간재 수출간의 변화하는 상관관계를 연구한다. 기존의 연구들은 해외투자가 모국 수출에 미치는 영향에 대해 ‘대체’ 혹은 ‘보완’ 이라는 두 범주 중 한 가지로 판단해왔다. 최근 관련된 한국의 연구들 역시 대체로 한국의 해외투자를 ‘수직적 해외투자’로 특징지으며, 해외투자가 무역에 긍정적인 영향을 끼친다고 밝혀왔다. 그러나 이 같은 이전 연구들은, 이러한 관계가 고정적이지 않으며 여건에 따라 ‘수직적 해외투자’ 에서 ‘수평적 해외투자’로 변화할 수 있음을 고려하지 않았다. 따라서, 본 연구는 지난 10년의 기간 동안 한국 제조업 분야에서 ‘수직적 해외투자’ 에서 ‘수평적 해외투자’로의 전환이 일어났는지 알아본다.

우선, 한국의 해외투자와 한국중간재 수출간의 상관관계가 2001년부터 2010년까지 어떻게 변화하는지 살펴본다. 그 후, ‘투자대상국의 시장 여건’ 과 ‘투자자의 여건’ 이 위의 관계의 변화 추세에 어떻게 영향을 미치는지 알아본다. 40개국 14개 산업으로 구성된 패널 데이터로 회귀 분석한 결과, 한국의

제조업은 전체적으로 ‘수직적 특화’를 강화해왔음을 알 수 있었다. 그러나 산업별 세부분석에서는 총 14개 산업 중 11개가 ‘수직적 해외투자’에서 ‘수평적 해외투자’로의 전환을 나타냈고, 반면 전체 총 제조업 해외투자의 40%를 차지하는 나머지 3개 산업은 지속적인 ‘수직적 해외 투자’ 강화 추세를 나타냈다. 투자자 규모에 따른 분석에서는, 대기업의 경우 중간재 수출에 미치는 긍정적 영향은 갈수록 약화되었고, 중소기업은 반대로 나타났다.

이 같은 분석 결과, 산업 차원의 분석에서는 대체로 ‘수직적 해외투자’에서 ‘수평적 해외투자’로의 전환이 나타나지만, ‘산업 내 고부가가치 생산단계에서 비교우위를 지켜냈는가’ 및 ‘해당 산업제품에 대한 세계 전반 수요의 급격한 상승 여부’에 따라 ‘수직적 해외투자’를 지속적으로 유지 가능함을 알 수 있었다. 그리고 전체 FDI의 구성 요소 중 ‘수직적 해외투자’ 가 주요 비중을 차지할 때, 국가 수준의 전체적인 해외투자의 추세 역시 수직적으로 특화될 역시 알 수 있었다.

핵심어: 해외투자가 모국에 미치는 영향, 수직적 해외투자, 수평적 해외투자, 전환, 해외투자, 중간재, 수직적 무역

학번: 2006-22589